

Novel Catalytic Reactor for CO₂ Reduction via Sabatier Process, Phase II

Completed Technology Project (2011 - 2013)



Project Introduction

A novel short contact time Microlith Sabatier reactor system for CO₂ reduction offers a significant advance in support of manned spaceflight. Compared to current and prospective alternatives (including microchannels), the reactor will be much smaller and lighter, more energy and resource efficient, and more durable. In the spacecraft cabin atmosphere revitalization system (ARS), the utilization of CO₂ to produce life support consumables, such as O₂ and H₂O, via Sabatier process as part of the CO₂ Reduction Assembly (CRA) is an important function for both low-earth orbit and long-term manned space explorations, and also has application for lunar/Martian ISRU concepts. The maturation of this technology will significantly reduce launch weight requirements and the need of re-supply from Earth. Precision Combustion, Inc. (PCI) proposes to build on Phase 1 proof of concept success to develop, demonstrate, and deliver an integrated Microlith

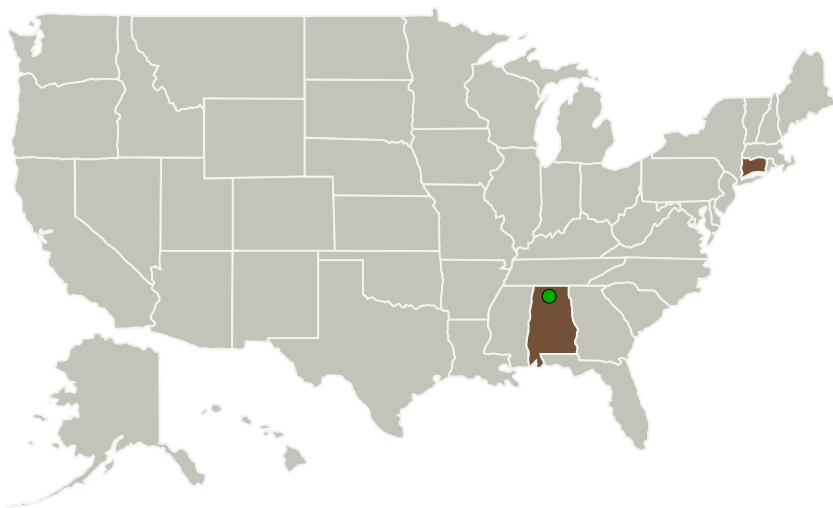
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-based ground test Sabatier reactor Development Unit (SDU) for CO₂ reduction, with collaborative support from a systems integrator. The SDU will convert CO₂ and H₂ to methane and water, achieving close-to-equilibrium CO₂ conversions at high throughputs and at low operating temperatures (≤ 350

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C). Major systems integrator participation will help guide the program. TRL is now 4 and will be advanced to 5.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Precision Combustion, Inc.	Lead Organization	Industry	North Haven, Connecticut
● Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	Connecticut

Project Transitions

**June 2011:** Project Start**May 2013:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/139179>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Precision Combustion, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Christian Junaedi

Co-Investigator:

Christian Junaedi

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Technology Maturity (TRL)

Start: 4
Current: 5
Estimated End: 5



Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
 - └ TX06.1 Environmental Control & Life Support Systems (ECLSS) and Habitation Systems
 - └ TX06.1.1 Atmosphere Revitalization

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System